

NORWICH WATER POWER COMPANY

HAER No. CT-147

West bank of Shetucket River

beginning approximately opposite Second  
Street and extending .8 miles northward  
Greeneville section

Norwich

New London County

Connecticut

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#### PHOTOGRAPHS

#### WRITTEN HISTORICAL AND DESCRIPTIVE DATA

#### HISTORIC AMERICAN ENGINEERING RECORD

National Park Service

Northeast Region

Philadelphia Support Office

U.S. Custom House

200 Chestnut Street

Philadelphia, P.A. 19106

## HISTORIC AMERICAN ENGINEERING RECORD

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Location:

West bank of Shetucket River,  
beginning approximately opposite Second  
Street and extending .8 miles northward  
Greeneville section, Norwich  
New London County, Connecticut

USGS Norwich Quadrangle

UTM Coordinates:

19.745610.4601620 (south end)

19.745940.4603940 (north end)

Date of Construction:

1829, 1882

Engineer:

James F. Baldwin (1829 dam and canal);  
Hiram Cook (1882 headgates and dam);  
Chandler & Palmer (c.1915 rebuilding)

Contractor:

Gaspar Webler (1829 dam and canal)

Present Owner:

City of Norwich, Connecticut  
City Hall  
Norwich, Connecticut 06360

Present Use:

Hydroelectric power generation

Significance:

The canal and dam of the Norwich Water  
Power Company, incorporated in 1828,  
was one of the earliest water power  
engineering projects in Connecticut.  
The company sold water power to  
manufacturers who built mills on a  
strip of land between the canal and the  
river. The village of Greeneville grew  
up around the canal's industrial  
activity and remained one of Norwich's  
most populous neighborhoods well into  
the 20th century.

Project Information:

This documentation was undertaken in  
1994-1996 in accordance with a  
Memorandum of Agreement among the  
Federal Energy Regulatory Commission,  
the Connecticut State Historic  
Preservation Office, and the Advisory  
Council on Historic Preservation. The  
dam will be modified to accommodate a  
fish passage.

Bruce Clouette

Historic Resource Consultants  
Hartford, CT 06106

### Description

The Norwich Water Power Company Dam and Canal includes a large timber-crib and masonry dam and a headgate structure dating from 1882, a long canal paralleling the Shetucket River on its west bank, a reinforced-concrete canal spillway built in the early 20th century, and numerous historically related industrial buildings clustered at the southern end of the canal. In addition, there are visible remains from the original episode of construction in 1829-1832. The associated village of Greeneville lies to the west of the canal and consists of a grid of streets filled with dozens of 19th-century worker tenements and other dwellings, churches, and commercial buildings.

The earliest portions of the resource are about 1,200 feet upstream from the present dam (known as the Greeneville Dam): they include stone abutments to the Norwich Water Power Company's original dam; the substructure of the original headgates, visible as stone piers with mortises in the sides for the gates; foundations for a second headgate structure, added to increase the intake capacity sometime after 1837; and more than 1,000 feet of canal that was no longer needed after the facility was reconfigured in 1882. Reportedly, remains of the base of the original timber dam can be discerned at low water.

The present dam dates from 1882 and appears as a planked timber-crib structure with sloping downstream face and wide two-step apron. However, only the central portion of the 399'-long rollway, which runs straight across the river between masonry abutments, is entirely of timber-crib construction. The remainder, at the two ends, contains portions of the original rubble masonry structure behind a planked timber-crib downstream face. The timber portions date from a rebuilding following a disastrous flood in 1886; the upper portions of the crib, as well as all of the apron and face planking, were completely rebuilt in 1915. A course of granite coping, to which flashboards can be secured to raise the level of water, runs along the crest of the dam.

The headgate structure, which also dates from 1882, provides six gated arched intakes for the canal. The mechanisms that operate the gates are sheltered by a board-sided gable-roofed gatehouse standing west of the dam's west abutment; the current gate operating mechanisms were installed in 1918.

The canal is about ten feet deep; it varies in width from about 65 feet to 100 feet at the northern end and has a uniform width of 65 feet as it passes through the industrial complexes at its southern end. The present banks of the canal are defined by

vertical rubble masonry walls. At the northern end, a reinforced-concrete spillway, built in 1923, sets an upper limit to the level of water in the canal.

The canal was originally constructed with a trapezoidal cross-section between earth-berm banks and measured 45 feet wide at the top and 18 feet wide at the bottom. Although the bulk of the canal was enlarged at the time of the construction of the 1882 headgates and dam, its original size and character can still be seen north of the dam, in the part bypassed in 1882.

The water in the canal can be let out by a drain gate set in a stone channel about 500 feet south of the headgates. The drain gate is sheltered by a smaller version of the gatehouse and also dates from 1882.

At the southern end of the canal are a number of multi-story brick factory buildings on the east bank that formerly were powered by the energy of water falling from the level of the canal to the Shetucket River below (the canal provides a head of about 17 feet). The oldest building dates from c.1840, with the majority built around 1900. The factory complexes spill over onto the west bank of the canal and even across the tracks of the Providence and Worcester Railroad (originally the Norwich and Worcester), which parallels the canal a short distance to the west. There formerly was at least one other large grouping of industrial buildings along the canal: the Hubbard paper factory, dating from 1860 and destroyed by fire in the 20th century. Several other smaller industrial enterprises were found here at one time or another and may be represented by archeological remains. The City of Norwich's municipal electric utility operates a 1926 power station at the southern terminus of the canal, as well as a more modern hydroelectric facility opposite Tenth Street.

#### Historical Background and Technological Significance

The facility built by the Norwich Water Power Company is an example of the diffusion of the model of speculative water power development first brought to fruition in this country in Lowell, Massachusetts. Following the successful conversion of a navigation canal to manufacturing purposes at Lowell in 1823 by Boston merchants, entrepreneurs throughout New England attempted to reproduce their results at other sites, even while Lowell itself underwent constant improvement with new dams, canals, and manufacturing facilities. The Norwich site was the first such development in Connecticut exclusively intended to provide

manufacturing power.<sup>1</sup> By damming a river that was probably too big for any single entrepreneur to harness, the company created a waterpower that allowed several enterprises to become established and eventually grow into large industrial concerns. The associated village of Greeneville became home to many of Norwich's residents and businesses, its fortunes rising and falling with those of the factories along the canal.

The idea for a dam on the Shetucket River in Norwich was the brainchild of William P. Greene (1795-1864). Greene was from a well-to-do Boston family and practiced law in that city following his graduation from Harvard in 1814. In 1824 he moved to Norwich to pursue a career in commerce and manufacturing, joining William C. Gilman in the Thames Manufacturing Company, which produced cotton cloth at Yantic Falls. Two years later, he began his plan to build a dam and canal and sell manufacturing sites to other entrepreneurs. He bought up land on both sides of the river from what became Greeneville to the next falls to the north, where the Quinebaug River joins the Shetucket. Greene then conveyed this property to the Norwich Water Power Company, which promptly set about building the dam and canal. Greene went on to become one of Norwich's leading citizens, operating large textile enterprises both at Greeneville and Yantic Falls. He also was president of the Thames Bank, one of the founders of the Quinebaug Bank and the Norwich and Worcester Railroad, an incorporator of the Norwich Free Academy, and mayor of the city in 1842.

Greene was the largest shareholder in the company, but he was joined by many other members of Norwich's business and professional elite. Among the first stockholders were Dr. Ralph Farnsworth, a medical practitioner; prominent lawyers and politicians such as George L. Perkins, James Lanman, and Calvin Goddard, the latter two of whom were judges and former members of Congress; merchants Jedediah Huntington, Daniel L. Coit, Arthur Gilman, and James Ripley; and manufacturers such as Greene's partner William C. Gilman, cotton mill owner Cushing Bells, and paper mill pioneers Amos and Russell Hubbard. The Hubbards, who ran what is said to have been the first American-made Foudrinier papermaking machine at Yantic Falls, moved their operations to Greeneville in 1860, occupying a large site north of Eighth Street.

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<sup>1</sup>Although the Enfield Canal (1827) was built primarily for navigation, its proponents recognized its industrial potential from the start, and in the 1830s several large industries were started along its banks.

Just as Lowell initially made use of a navigation canal, so too the Norwich Water Power Company was the direct descendant of the Quinebaug Canal, an abortive attempt to link Norwich, located at the head of tidewater navigation, with inland western Massachusetts. The canal never got further than surveying a route along the Shetucket and Quinebaug Rivers. That survey, however, formed the basis for the engineering of the Norwich Water Power Company's facility, as well as for the eventual building of the Norwich and Worcester Railroad.

The engineer for both the Quinebaug Canal and the Norwich Water Power Company project was James F. Baldwin (1782-1862). Baldwin was the son of the prominent engineer Loammi Baldwin, who had designed the Middlesex Canal, as well as the brother of Loammi Baldwin, Jr., another well-known Boston civil engineer. James Baldwin in the 1820s became a major proponent of linking Boston with western markets via a railroad, and himself surveyed the route that later would become the Boston and Albany or Western Railroad. Although he never achieved the stature of his father or brother, Baldwin collaborated on or was principally responsible for several major engineering works of the antebellum period, including the Boston and Lowell Railroad and the Boston municipal water-supply reservoir at Lake Cochituate.

Baldwin was aided in the Norwich project by the surveyor William S. Prentice (b. 1798), whose name appears on the surveys of manufacturing sites that were made part of the original leases in the 1830s. After working several years as a clerk in a country store, Prentice attended Harvard but did not graduate. In the late 1820s he assisted Baldwin with the survey of the western railroad route in Massachusetts, and Baldwin's memoranda book makes clear that Prentice was left in charge of much of the surveying at Norwich while Baldwin attended to other projects underway, which included water power developments in Grafton and Billerica, Massachusetts, and a new lock for the Enfield Canal in Suffield, Connecticut. Prentice eventually left the field of engineering and moved in 1832 to LaGrange, Indiana, where he became a well-to-do farmer and community leader.

There is no known prior direct link among Greene, Baldwin, Prentice, and the entrepreneurs who developed Lowell. However, both Baldwin and Greene pursued mercantile interests while undertaking their careers as professional men in Boston and likely became well-acquainted with the Lowell project. Moreover, Baldwin was the agent of the Middlesex Canal at the time and in that capacity probably dealt with the Lowell manufacturers concerning shipments of materials. Baldwin began working directly for the Lowell proprietors starting in 1830, while his Norwich project was still under construction, after

Patrick T. Jackson hired him to lay out the route of the Boston and Lowell Railroad.

The contractor for the project was Gaspar Webler from the small inland town of Columbia, Connecticut. Although the dam was finished on October 29, 1829, the canal took longer and was incomplete even as the first leases for manufacturing sites were executed in 1832. In the meantime, the Company leased out fishing rights to the water below the dam, which must have teemed with shad, salmon, and other fish prevented from continuing their usual movement upstream.

In leasing out manufacturing sites, the company took care to protect its investment. Brick or stone construction and slate roofs were mandated for all factory buildings. No chemical works, furnaces, powder works, or other dangerous uses were allowed, and alcoholic spirits were forbidden on the premises. For an annual rent of \$150 per mill power (equivalent to what would power a cotton mill of 4,000 spindles), the company guaranteed it would provide the water and maintain the dam and canal in good condition. Individual intakes, water wheels, and tailraces were the responsibility of the manufacturers.

The company also established a series of streets in a grid pattern west of the canal and the projected route of the Norwich and Worcester Railroad and divided the blocks up into lots for sale. Several of the manufacturers bought property nearby their mill privileges while other lots were sold to factory employees, merchants and speculators. The water power company acted as mortgage banker for many of the purchasers, financing the erection of stores, tenements, and other buildings in the village that was immediately named Greeneville in honor of the canal's chief proponent.

Writing in 1833, just a year after leasing began, local surveyor William Lester described the activity at Greeneville and predicted the village's future prosperity:

Two or three years since a Dam was built by the Norwich Water Power Company across the Shetucket at this place, which is calculated to afford sufficient power to carry 40 or 50 thousand spindles, and about half the amount of which have been sold and extensive manufacturing establishments have been erected; two large cotton mills, a paper mill, a button mill, a flannel manufactory, and a carpet and rug manufactory, which, for the great perfection attained, the latter establishment deserves particular commendation. This village is laid out with streets intersecting each

other at right angles, and bids fair, ere long, to be a populous and thriving place.<sup>2</sup>

Not all the early enterprises prospered; the button shop, which had 35 women at work making bone buttons in 1832<sup>3</sup>, apparently had disappeared by 1837. However, the canal itself was a success. Among the first large factories to be built was the Quinebaug Company's cotton mill at the southern end of the project; it was sold to Thames Manufacturing (Greene's company) before the building was finished. Thames Manufacturing Company operated successfully for a time but went bankrupt in the Panic of 1837; it was succeeded by the Shetucket Company, which enlarged the cotton mills and ran well into the 20th century. The next important lessee was the Chelsea Manufacturing Company, a paper manufacturer which began in 1835 and expanded its production until it occupied several interconnected multi-story buildings. Another long-term lessee, established in 1840, was the Norwich Bleaching and Calendaring Company, a cloth finishing firm later known as the Norwich Bleaching, Dyeing, and Printing Company. All three of these prospered and ranked among the city's largest industries, each employing hundreds of people. Chelsea Manufacturing, for example, ran 19 papermaking machines in 1870, with 200 men and 100 women making fine writing paper at a rate of 10 tons a day; its plant was valued at \$400,000. A 360-hp steam engine supplemented the 400 hp produced by its five water wheels.

Although not as large as Chelsea Manufacturing Company, the Hubbard paper mill was a substantial establishment, with five rag engines and two papermaking machines in operation in 1886.<sup>4</sup> Smaller enterprises known to have existed at one time or another along the canal, for which there are now no easily discernible remains, include a screw shop, machine shop, dye works, wooden-type factory, and two commercial gristmills. The survey of water power conducted as part of the Tenth Census of 1880 estimated the total rated output of the factories' waterwheels at some 1,600 to 1,700 horsepower, with many manufacturers supplementing the water power with steam engines.

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<sup>2</sup>A Sketch of Norwich, Including Notes of a Survey  
(Norwich: J. Dunham, 1833), p. 5.

<sup>3</sup>Louis McLane, Documents Relative to the Manufactures in the United States. House Document No. 308, 22nd Congress, 1st Session.

<sup>4</sup>Lockwood's Directory of the Paper and Stationery Trades, 1886-87. p. 30.



With the continued prosperity of the various enterprises along the canal, the village of Greeneville became one of Norwich's most populous outlying areas. By the time of the Civil War the two blocks along North Main and High streets were densely built between Second and Twelfth streets, with numerous additional houses scattered along Prospect and Pleasant streets. Greeneville was formally incorporated into the City of Norwich (a separate government for the built-up part of the town) in 1874.

Sometime between the survey of Greeneville in 1837 and the reconstruction project of 1882, the company raised height of the dam and doubled the intake capacity of the canal. The north end of the canal was widened and an additional set of headgates was built adjacent to first. The need for a reliable flow of water was probably becoming more acute as the various factories increased their productive capacity. Moreover, some of the enterprises such as the paper manufacturers and the Norwich Bleaching and Calendaring Company undoubtedly also made use of industrial processing water from the canal.

A similar concern appears to have prompted the widening of the canal and the building of a new dam and headgate structure in 1882. Since the northern part of the embankment had not been put to use, nothing was lost by relocating the dam downstream. In addition to greater capacity and improved flow, the project resulted in greater pondage and reduced the problems (such as icing and seepage) associated with long canals.

The engineer for the 1882 dam and headgates project was Hiram Cook (1827-1927). Cook, who was also president of the Norwich Water Power Company at the time, had only a common-school education and a little private tutoring. However, while working as a school teacher, he studied engineering and surveying on his own, and he was able to find work as an assistant engineer during the construction of the New London Northern Railroad (1849). In 1860 he went to work for the Norwich and Worcester Railroad, assuming responsibility in 1866 for the maintenance of all their buildings, track, and bridges. He also had a private practice as a civil engineer, and around 1880 became president of the Norwich Water Power Company. Although he retired from consulting around 1890, he continued to advise the company and to perform whatever engineering was needed; in 1896 he resumed the presidency. As late as 1915, he undertook the survey of the dam's structural integrity that resulted in its rebuilding that year.

In the early 20th century, the timber portions of the dam were found to be deteriorating and so the top seven or eight courses

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were replaced. The headgate operating mechanisms and the canal overflow spillway were rebuilt shortly thereafter.

The engineers for the facility's 20th-century improvements were Chandler and Palmer, Norwich's leading engineering firm of the period. Dating back to the first third of the 19th century, the firm's modern history began in 1877, when Charles E. Chandler took over the practice upon the retirement of Gen. William C. Stanton. Chandler (1852-1928) was educated at Woodstock Academy and learned engineering in the firm of Edgar Clark of Putnam. He served as City Engineer for Norwich for many years, during which time he was responsible for numerous bridges, roads, and components of the City's water system. His partner from 1897 on was Shepard B. Palmer (1871-1945), an 1894 graduate of Worcester Polytechnic Institute. Both men were members of the State Board of Engineers, which had oversight over dam construction. Together Chandler and Palmer designed a majority of the engineering structures in the Norwich area in the late 19th and early 20th centuries. Among their clients were all the major textile manufacturers, the City Water Department, and local gas, street-railway, and electric utilities.

The dam and canal are still in use, providing water to power the hydroelectric plants at its southern end and at Tenth Street. In anticipation of the latter, the dam, headgates, canal, and water rights were purchased by the City of Norwich in 1961, which operates the property through its municipal power utility.

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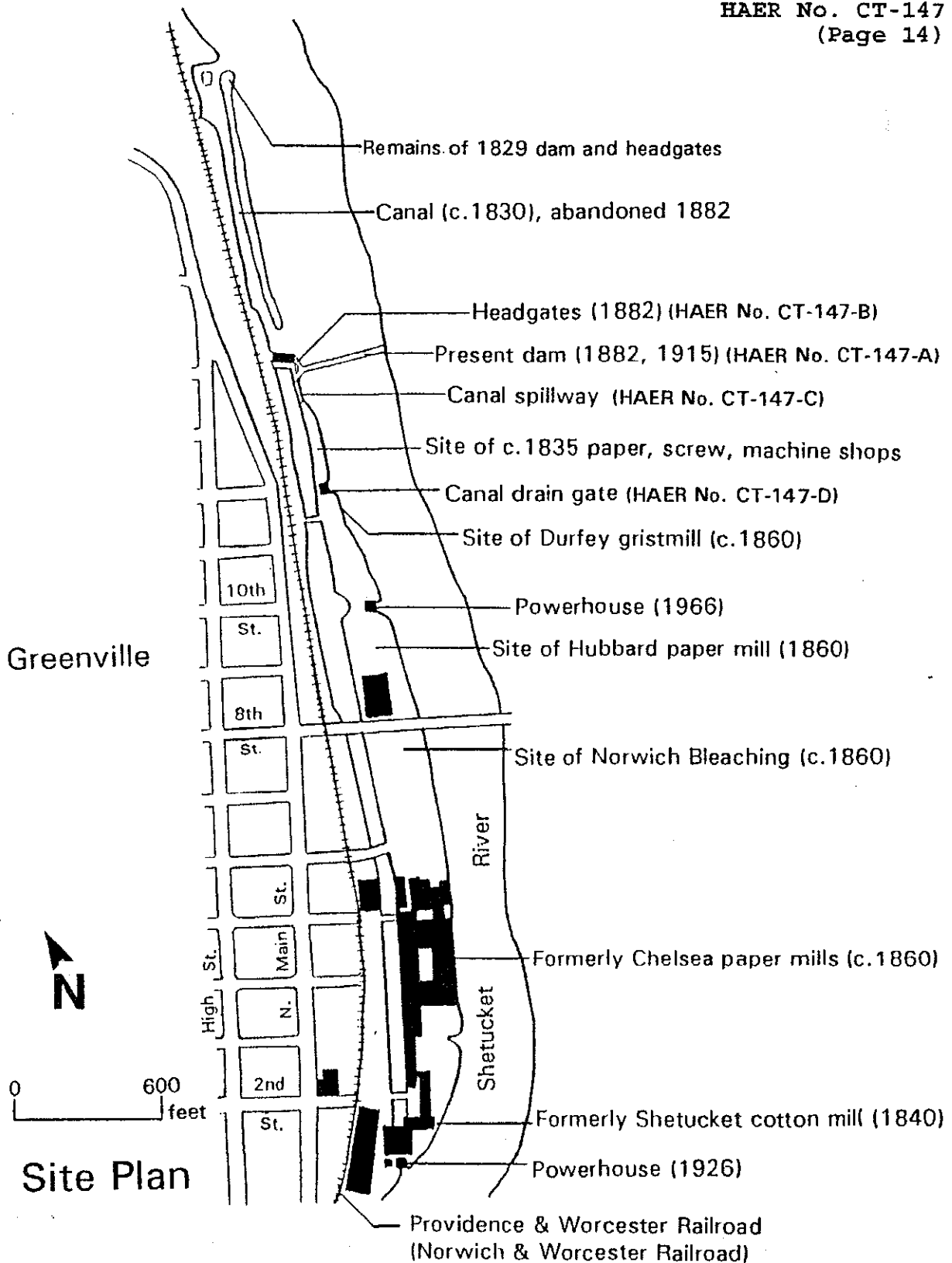
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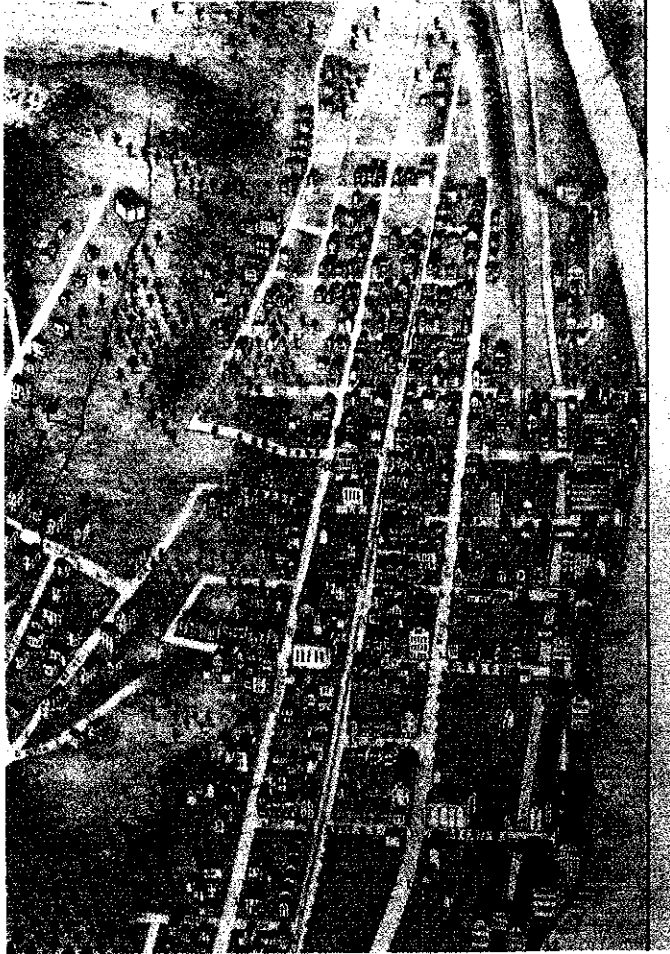
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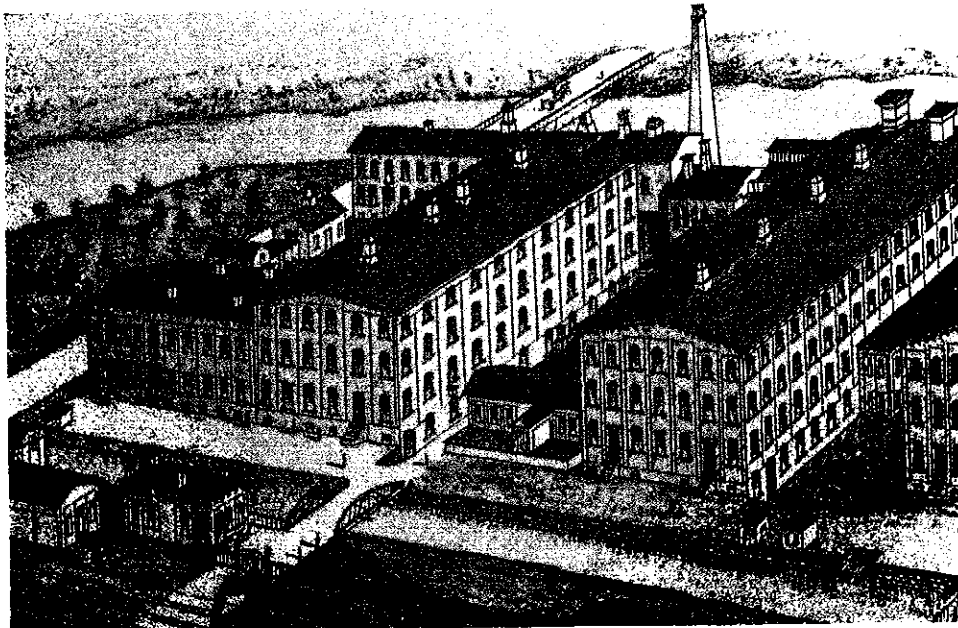
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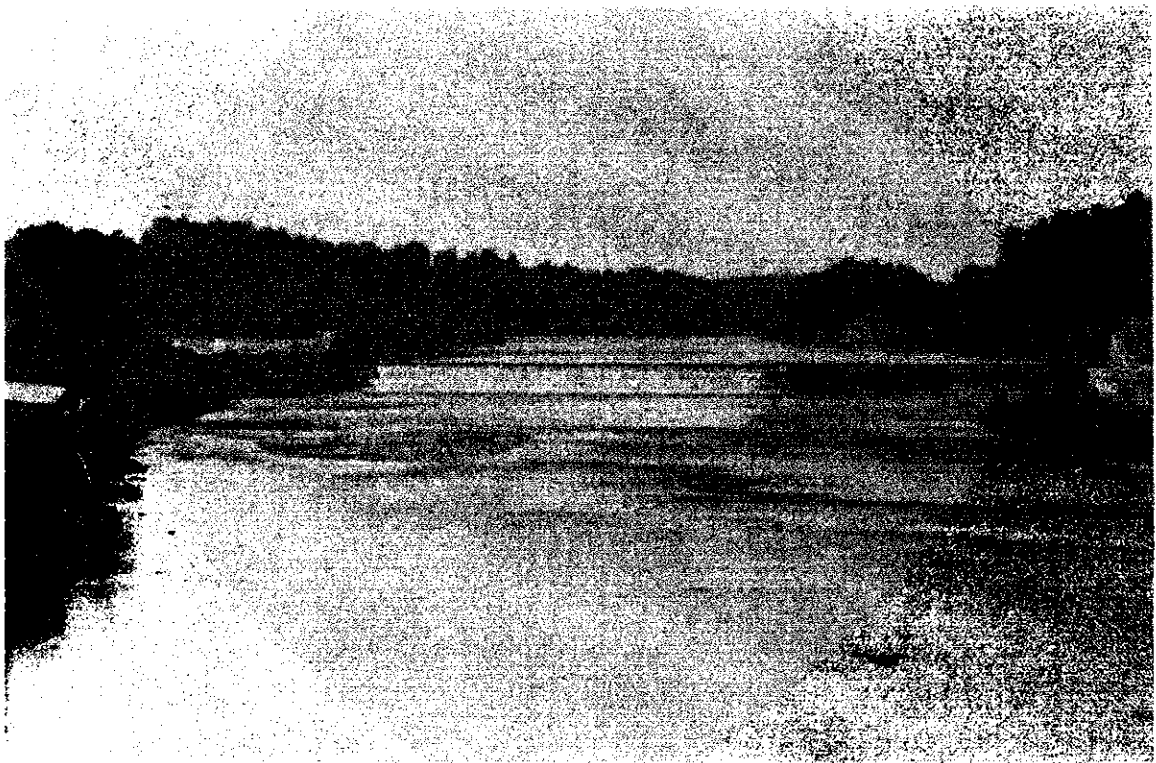


View of Greenville, O. H. Bailey, 1876





Norwich Bleaching and Calendaring Company mills, with canal  
in foreground, detail from O. H. Bailey, 1876



View of gatehouse and dam, Art Work of Norwich (1898)